Original Article / Özgün Araştırma

Evaluation of the Dental Referral Process from the Patients Perspective

Hasta Bakış Açısından Dental Yönlendirme Sürecinin Değerlendirilmesi

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Abstract

Objective: This study aimed to discover patients' perspectives on the factors that influence the referral process by using structural equation modeling (SEM) and testing the determinants of the referral process.

Materials and Methods: This observational study was consisted of 1.300 patients and finally total of 968 participants completed the questionnaire. A self-reported questionnaire consisting of ten items was used. It comprised questions about demographic variables, medical and dental histories, frequency of dental visits, and personal attitudes toward the referral process. In the present study, SEM models consisted of path analysis, multiple regression, and multivariate regression analysis with continuous type data.

Results: The model showed that "number of decayed teeth" and "number of missing teeth" had a directly predictive effect on referral process. Gender, age, education and income level, habitation, and dental visit frequency had indirectly predictive effects on the referral process.

Conclusion: Pain related with number of missing teeth and functional limitation related with number of missing teeth had directly predictive effect on the referral process from the patients' perspective

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Öz

Amaç: Bu çalışma, hastaların referans sürecini etkileyen faktörler üzerinde yapısal eşitlik modellemesi (YEM) kullanarak, referans sürecinin belirleyicilerini test etmeyi amaçlamaktadır.

Gereç ve Yöntemler: Bu gözlemsel çalışmaya 1,300 hasta dahil edilmiştir ve son olarak toplam 968 katılımcı anketi tamamlamıştır. On maddeden oluşan kendi kendine bildirilen bir anket kullanılmıştır. Bu anketlerde demografik değişkenler, tıbbi ve dental öyküler, diş hekimliği ziyaretlerinin sıklığı ve referans sürecine yönelik kişisel tutumlar ile ilgili sorular bulunmaktadır. Bu çalışmada YEM modelleri path analizi, çoklu regresyon ve çok değişkenli regresyon analizinden oluşmuştur.

Bulgular: Model, "çürük sayısı" ve "eksik diş sayısının" referans süreci üzerinde doğrudan bir etkiye sahip olduğunu göstermiştir. Cinsiyet, yaş, eğitim ve gelir düzeyi, yerleşim yeri ve diş hekimi ziyareti sıklığı, sevk süreci üzerinde dolaylı olarak etki göstermektedir.

Sonuç: Ağrı, fonksiyonel kısıtlama ve sosyal baskı, hastalar açısından referans süreci üzerinde doğrudan bir etkiye sahiptir.

Introduction

In dentistry, referral process may be defined as the transfer of a patient from one dentist to another dentist or to a physician. No single dentist can be expected to be skilled or experienced at every procedure in the field of dentistry (1). Thus, the referral process should be considered as an integral part of a dental practice. The referral process itself is particularly complex as it ultimately depends on an agreement of both dentist and the patient upon appropriate referral (2). Patients may need to be referred for several reasons including their personal desire, medical complications and complexity of treatment (1). In addition, many factors might influence the decision to refer: demographic variables such as gender, age, and experience, have a significant impact on the number of referrals per month (3). Consequently, dentists' understanding of the referral process is important in terms of building a successful and effective dental practice.

Various studies (3-6) have examined the referral process with an emphasis on investigating how dentists make referral decisions and what factors influence these decisions. Generally training of the dentists, experience of the dentists, lack of diagnostic system, communication problems, treatment needs and regulations were the main reasons for the referrals (3-6). Different research reports have documented almost all dental specialties. Park et al. (6) reported that among general practitioners clinical skills were the primary factor influencing the referral decision. On the other hand, it has been reported that the most common criteria for the selection of a specialist (e.g. periodontist or orthodontist) was the positive experience of the patients from their successful treatments (7,8). Berlin et al. (9) reported that there is variation among general dentists in terms of whether they provide endodontic treatment and treatment of trauma. Some dentists in their study provided treatment themselves while others referred their patients to specialists.

Despite the availability of general studies on this issue, to the best of our knowledge, no study has investigated the referral process from patients' perspectives. We aimed to discover patients' perspectives on the factors that influence the referral process by using structural equation modeling (SEM) and testing the determinants of the referral process.

This approach allowed for simultaneous development of summary factors that improved the measurement of each primary construct (e.g., age, sex, income level) that was tested in the hypothesized model.

Materials and Methods

Study Population

This observational study was consisted of 1.300 patients that referred to the Erciyes University Faculty of Dentistry, Department of Periodontology, between November 2015 and April 2018. From out of initial number of 1.300 patients 322 declined to participate the study and a total of 968 participants (533 female, age range of 19-69 years; 435 male, age range of 19-73 years) completed the questionnaire.

Ethical Considerations

The study details were explained to all participants. A written informed consent was obtained from each participant before the initiation of the study. The study protocol was approved by the Erciyes University Faculty of Medicine (protocol number: 08.01.2016, 2016/01).

Questionnaire

A self-reported questionnaire consisting of ten items was used. It comprised questions about demographic variables, medical and dental histories, frequency of dental visits, and personal attitudes toward the referral process.

Clinical Examination

One examiner determined the number of missing teeth and carious lesions, extraction indicated teeth, and periodontal health status during the clinical and radiological examination. Clinical periodontal examination was carried out using a periodontal probe (Williams probe). Patients with agressive periodontitis and chronic periodontitis determined in accordance with the clinical and radiographic criteria proposed by Armitage 1999. Additionally gingivitis was diagnosed while the presence of the gingival inflammation symptoms with normal periodontal probing depth.

Statistical Analysis

SEM statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions was used as the primary method for examining the predictors of the referral process from the patients' perspectives by employing AMOS 21. Applying the methods

recommended by Kline (10), to evaluate the goodness of fit of a model, the relative/normed chi-square ($\chi2/df$), the root mean square error of approximation (RMSEA) statistic, the goodness-of-fit statistic (GFI), and the comparative fit index (CFI) were used. Although there is no consensus regarding an acceptable ratio for $\chi2/df$, authors generally recommend that it be under 2.0. For RMSEA, the lower limit is close to 0, whereas the upper limit should be <0.08 for a well-designed model. For GFI and CFI, a cut-off criterion of ≥0.95 has been recommended, but ≥0.90 has also been considered acceptable (1,2). Because CFI is one of the measures least affected by sample size, this index is especially important for observing the model fit. All of these parameters should be fulfilled to constitute an acceptable model. In this model the dependent variable (personal attitudes toward the referral process) determined as the answer given to a question in the questionannaire.

Briefly, in the present study, SEM models were consisted of path analysis, multiple regression, and multivariate regression analysis with continuous type data. SPSS 21.0 AMOS was used for the SEM analysis. Descriptive statistics of the participants' demographic characteristics and clinical features were also presented.

Results

The questionnaire was answered by a total of 978 participants with a response rate: of 75.2%. However, ten participants' questionnaires were discarded due to incompleteness leaving data from 968 participants for inclusion in the final analysis. Demographic data of the participants is shown in Table 1.

The mean age of the participants was 34.4 years and 44.9% of participants were male. Most of the study population was not employed in the health care. A total of 73.1% of the participants lived in urban district. The mean number of residents in participants' households was 3.17, and 53% of the participants reported that their income level was <1400 Turkish liras. Generally good health was reported by 85.3% of the participants, and 80.6% of the participant reported visiting the dentist only in the presence of a dental problem. The mean number of participants with indications of tooth extraction was 0.88 while the mean number of patients with missing teeth or decayed teeth was 3.0 and 2.75, respectively. In addition, 61% of the participants were diagnosed with gingivitis while the remainder were diagnosed with periodontitis (Table 2).

Plaque and gingival index scores, probing depth and clinical attachment loss values were significantly higher in periodontitis groups than healthy and gingivitis groups. In addition, there was no significantly difference between agressive and chronic periodontitis groups. Bleeding on probing percentage was significantly higher in periodontitis groups, therefore gingivitis groups scores were significantly higher than healthy group (Table 3).

The determinants of the referral process have also been examined from the patients' perspectives. The coefficients and GFIs for the model are presented in Figure 1. The model showed that "number of

Table 1. Descriptive data of the study population	
Age Mean min - max	34.4 19-73
Gender Male Female	435 (44.9%) 533 (55.1%)
Education level Primary education Secondary education High school University Postgraduate/doctorate	262 (27.1%) 139 (14.4%) 306 (31.6%) 250 (25.8%) 11 (1.1%)
Occupation Health sector Other	15 (1.5%) 953 (98.5%)
Habitation Village District Town	68 (6.8%) 194 (20%) 708 (73.1%)
Income level <1300 TL 1300-2500 TL >2500 TL	513 (53%) 289 (29.9%) 166 (17.1%)
Household number Mean min-max	3.17 1-10
Systemic health Yes No	142 (14.7%) 826 (85.3%)
Dental visit frequency Once a 6 month Once at 1 year In problem Never visited dentist	53 (5.5%) 84 (8.7%) 780 (80.6%) 51 (5.3%)
TL: Turkish liras, min: Minumum, max: Maksimum	

caries" and "number of missing teeth" had a directly predictive effect. Gender, age, education and income level, habitation and dental visit frequency had indirectly predictive effects on the referral process. In addition, periodontal health status and the number of teeth with extraction indication had no effect on this process (Figure 1).

Discussion

This study aimed to evaluate the dental referral process from patients' perspectives. The main hypothesis of this study was that only the number of decayed or missing teeth would have an effect on this process due to the painful nature of decay and the functional limitations caused by missing teeth. In accordance with our hypothesis, the findings of the

present study revealed that the number of teeth with caries lesions and the number of missing teeth had a direct predictive effect on the referral process from the patients' perspectives.

Previous studies (3-6) have mostly focused on this process from the dentists and or physicians' perspectives. These studies have attempted to answer the question "which conditions or factors influence the decision making criteria of dentists/pysicians?". The referral process is complex and influenced by many factors. Consequently, patients' perspectives
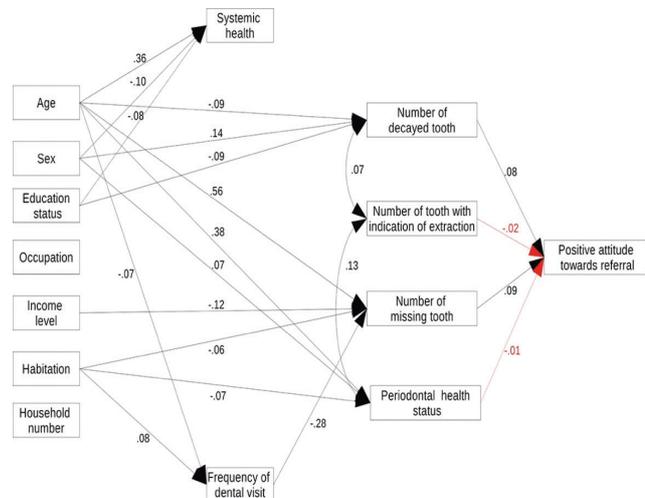

Figure 1. Structural model for the determinants of the referral process from patients' perspectives

$\chi2=70.867$; DF=59 $\chi2$/df=1.201 goodness-of-fit index=0.990; comparative fit index=0.989; root-mean-square error of approximation=0.014; p=0.138

*p<0.05; **p<0.01; ***p<0.001

Table 2. Oral health status of the study population	
Tooth with exraction indication	
Mean	0.88
min - max	0-18
Missing teeth	
Mean	3.0
min - max	0-24
Decay teeth	
Mean	2.75
min - max	0-14
Periodontal health status	
Healthy	62 (6.4%)
Gingivitis	517 (53.4%)
Chronic periodontitis	371 (38.3%)
Agressive periodontitis	18 (1.9%)
min: Minumum, max: Maksimum	

Table 3. Comparison of the clinical periodontal parameters of the study groups					
	Heathy	**Gingivitis**	**Chronic periodontitis**	**Agressive periodontitis**	**p**
PI (mean ± SD)	0.31±0.4[a]	0.54±0.5[a]	1.97±0.7[b]	1.46±0.4[b]	0.023
GI (mean ± SD)	0.29±0.3[a]	0.51±0.3[a]	1.88±0.4[b]	1.54±0.6[b]	0.041
PD median min - max	1.12[a] 1.10-1.68	1.27[a] 1.14-1.88	4.14[b] 2.52-4.59	4.87[b] 2.76-5.43	<0.001
CAL (mean ± SD)	0.32±0.4[a]	0.44±0.6[a]	4.27±0.8[b]	5.53±1.1[b]	<0.001
BOP median min - max	4.20[a] 0-8.5	19.3[b] 12.4-34.3	82.6[c] 62-100	81.1[c] 49-100	<0.001
Different superscript letters within rows differ significantly. p<0.05: Significant difference					
SD: Standard deviation, PI: Plaque index, GI: Gingival index, BOP: Bleeding on probing, Cal: Clinic attachment loss, PD: Probing depth					

of this issue must not be overlooked. To the best of our knowledge, this is the first study to examine this process from patients' perspectives.

Despite its relatively recent emergence over the past few decades, questionnaires of the oral health related life quality has important implications for the clinical practice of dentistry and dental research. Oral health-related quality of life (OHRQoL) is a multidimensional construct that includes a subjective evaluation of the individual's oral health, functional well-being, emotional well-being, expectations and satisfaction with care, and sense of self (11). Our model showed that the number of decayed teeth and the number of missing teeth had a directly predictive effect on the attitudes of patients toward the referral process. Similarly, Wong et al. (12) reported that missing teeth highly correlated with OHRQoL. Likewise, the meta-analysis conducted by Gerritsen et al. (13) suggested that tooth loss was associated with impairment of OHRQoL. In the same study, it has also been reported that location and distribution of tooth loss within the mouth affects the severity of the impairment. For example, while a missing tooth in the posterior segment might cause functional limitation, a missing tooth in the anterior region causes both functional limitation and esthetic problems.

Different results have been documented in the literature related to the effects of the number of decayed teeth on the quality of life of the patients. Similar to the present findings, Li et al. (14) documented that the presence of dental caries had a negative effect on OHRQoL. However, contrary to our findings, Christensen et al. (15) reported no relationship between the number of decayed teeth and OHRQoL. Nonetheless, the number of decayed teeth presumably causes functional and esthetic impairments of chewing chewing function in cases of localized in posterior and esthetic depending on the anterior localization of the decayed which might affect quality of life and, consequently, patients' attitudes toward the referral process.

While the number of missing teeth had an effect on the process, the number of teeth with extraction indications did not effect on the attitudes of the patients. This finding might be explained by patients' lack of knowledge in which or how many teeth must be extracted. Although department of periodontology was the first clinic involved in the treatment process, department of oral diagnosis and radiology department determined the indication of the extractions. Within the university setting, periodontology specialists give the final decision on which teeth should be extracted.

Our model also showed that periodontal disease had no predictive effect on the attitudes of patients toward the referral process. Most of the population neither recognize the symptoms of periodontal disease nor associated symptoms with the disease (16). Since the most common symptoms of periodontal disease are swelling, bleeding upon brushing and redness (12) which are painless except some particular diseases (necrotising ulcerative gingivitis, necrotising ulcerative periodontitis and periodontal abscess), they do not cause any functional limitation and social pressure. For these reasons, this finding should be expected.

The frequency of dental visits had a directly predictive effect on tooth loss, but no effect on the incidence of periodontal disease. Similar to this finding, Renvert et al. (17) reported that individuals who regularly visited the dentist retained more teeth, yet, the frequency of dental visits had no impact on plaque deposits, gingival inflammation or alveolar bone levels.

In addition, our model showed that habitation had an effect on the number of teeth lost and on the presence of periodontal disease. Likewise, educational status had an effect on the number of decayed teeth. In accordance with these outcomes, World Health Organization has documented that the use of oral health services is markedly low among people living in rural areas and people with low income and education (18).

The present study has the following limitations. First, decayed or missing teeth are not categorized in terms of location (e.g., anterior or posterior). Second, the severity and extent of periodontal disease was not evenly distributed in the study group. Third, mobility of the teeth and furcation problems could be included in the model. Finally, only mean probing depth and the number of teeth with >5 mm probing depth were included in the model.

Conclusions

Within the limits of the present study, it can be concluded that pain related with number of missing

teeth and functional limitation related with number of missing teeth had directly predictive effect on the referral process from the patients' perspective.

Ethics

Ethics Committee Approval: The study protocol was approved by the Erciyes University Faculty of Medicine Ethics Committee.

Informed Consent: A written informed consent was obtained from each participant before the initiation of the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Z.T., Concept: A.B.A., Design: Z.T., A.B.A., C.G., Data Collection or Processing: C.G., Analysis or Interpretation: Z.T., A.B.A., Ö.Ç., C.G., Literature Search: Ö.Ç., Z.T., Writing: Z.T., Ö.Ç.

Conflict of Interest: The authors declare that there is no conflict of interest concerning the contents of the study.

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